

**Notice of Allowability**

Application No.

09/988,685

Applicant(s)

SHIOYA ET AL.

Examiner

David L. Hogans

Art Unit

2813

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to the Request for Continued Examination filed on August 27, 2004.
2. ☒ The allowed claim(s) is/are 29-31 and 33-47.
3. ☒ The drawings filed on 20 November 2001 are accepted by the Examiner.
4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☒ All b) ☐ Some\* c) ☐ None of the:
    1. ☒ Certified copies of the priority documents have been received.
    2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.  
**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
  6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
    - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
    - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date \_\_\_\_\_
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date \_\_\_\_\_
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other

  
CARL WHITEHEAD, JR.  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 2800

### **DETAILED ACTION**

This Office Action is in response to the Request for Continued Examination filed on August 27, 2004..

### **EXAMINER'S AMENDMENT**

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with George Loud on October 20, 2004.

The application has been amended as follows:

- Claim 29 after "plasma" in line 7; please insert the following: ", and forming a silicon-containing insulating layer on the copper diffusion preventing layer."
- Please cancel Claim 32

### ***Status of Claims***

Claims 29-31 and 33-47 are pending. Claims 38-46 are reinstated. Claims 1-28 and 32 are cancelled.

***Claim Rejections - 35 USC § 112***

The rejection of Claims 29-37 and 47 under 35 U.S.C. § 112, second paragraph, has been withdrawn pursuant to Applicant's Amendments submitted on August 27, 2004, and October 20, 2004.

***Double Patenting***

The nonstatutory double patenting rejection of Claims 29-37 and 47 over Claims 1-4 of 6,479,408 to Shioya et al. in view of 6,383,925 to Ngo et al. are withdrawn pursuant to Applicant's Amendments submitted on August 27, 2004, and October 20, 2004.

***Allowable Subject Matter***

2. Claims 29-31 and 33-47 are allowed.
3. The following is an examiner's statement of reasons for allowance.

The prior art of record fails to teach, in combination with the other claimed features, forming a copper diffusion preventing layer by exposing a copper surface to a plasma process gas consisting essentially of  $N_2O$  and a hydrocarbon  $C_xH_y$  and forming a silicon-containing insulating layer on the copper diffusion preventing layer.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

***Conclusion***

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

US 2001/0037568 to Uner et al. teaches treating a copper surface with a  $N_2O$  and hydrocarbon  $C_xH_y$  plasma, but fails to teach forming a silicon-containing insulating layer on the copper diffusion preventing layer.

6,089,445 to Sindzingre et al. teaches exposing a copper surface to a  $N_2O$  and hydrocarbon  $C_xH_y$  plasma but also simultaneously introduces an adjacent gas mixture comprised of silane.

6,066,196 to Kaloyeros et al. teaches depositing copper source precursors with nitrous oxides and hydrocarbon gases.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David L. Hogans whose telephone number is (571) 272-1691. The examiner can normally be reached on M-F (7:30-4:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead Jr. can be reached on (571) 272-1702. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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